

LEARNING DISABILITIES RELATIONSHIP WITH SOME BIOLOGICAL FACTORS

- COMPARATIVE STUDY -

NAWAF M. AL - DHAFEERI

Associate Professor of Special Education, College of Basic Education, China

ABSTRACT

The study aimed at investigating the relationship between some biological factors (Thyroid Gland, Mineral Salts, Protein) and learning disabilities. The sample of the study consisted of (18) students with learning disabilities and (28) normal students, and for achieving the study objectives, researcher used the students' blood tests to mark the rates of both thyroid hormones, T4 and TSH, the rate of mineral salts (Potassium, Sodium, Calcium, Magnesium), and also the protein rate, and comparing it with the normal average of this variables. This results showed that there weren't statistically significant differences between normal students and students who have learning disabilities with this variables.

KEYWORDS: Learning Disabilities, The Thyroid Gland, Mineral Salts, Protein

INTRODUCTION

Reasons of learning disabilities have a great interest and concern by many of the interested parties in the field of learning disabilities from different specialties, and there is no doubt that medicine is on the most interested branches in knowing the causes of any phenomenon, case or disease, and throughout the rapid technological development at the present time and the invention of new tools and methods which are used to assess the brain activity more accurately than before, such as CT Brain, MRI, Functional MRI, Positron Scan, Spectrum Analysis of Functional MRI, which contributed in an effective way in studying the differences between individuals in the functional performance of brain or Central Nervous System, which gave a chance to the people working in the field of learning disabilities to benefit from this technological development (Alalogi, 2008).

The main action of the thyroid gland hormones in human body (as showed by Kligman et.al, 2007) takes place by increasing the supply and consumption of oxygen in cells, stimulating the formation of proteins in the body, stimulating the growth of various tissues in the body including brain and nerves, helping in the metabolism of carbohydrates, proteins and vitamins. Upon the decreasing of the levels of thyroid gland hormones, pituitary gland stimulates and secretes TSH hormone which helps, in a direct and rapid way, in releasing T4 and T3 hormones from Thyroglobulin which exists in follicles in order to support the releasing of iodine (Alnagi and Alsafdi, 2010).

Rovet's study (2005), which aimed at comparing the intelligence averages of children between six and seven years who are suffering from Hypothyroidism / Thyroid Insufficiency on a sample consisted of 98 Children (49 of them are infected and 49 aren't infected), showed that there are differences in the averages of intelligence between both groups for the normal students group. Wong's Study (2004) and over five years aimed at comparing the children who are suffering from Hypothyroidism with their peers of children who aren't infected with fats increase and obesity in Britain, and results showed that there is an increase in the level of fats, body mass and weight with the children who are suffering from Hypothyroidism compared to their normal peers. Oerbeck's study et.al, (2003) aimed at recognizing the impact and relationship of Thyroxine treatment on the mental, motor and academic skills of the adults by comparing a group of 49 persons, from those who are suffering from congenital hypothyroidism since childhood, and a group of 41 normal persons,

and results showed that there is a significant decrease in the different skills with 24% of the infected persons, while there is a difference of 6% in normal persons, and the study also showed that there is a relationship between mental, motor and academic skills, and the activity of thyroid gland hormones and Thyroxine treatment.

Yet, food and healthful nutrition are considered important factors which are relevant / related to all aspects of humans whether the physical or psychological ones, and the non-availability of the nutritional components with their normal averages in the human body will result in many problems related to the biological, psychological or emotional aspects of the individual, because the relationship between food, with its different components and cognitive aspects and others are seemed to be a close relationship, according to many studies and resources in that field, Abo Zeid's study (2008) indicates that there is a relationship, which proved by many researches between nutrients, achievement, intelligence level. Researches showed that students who receive doses of vitamins and minerals are showing improvement in their scholastic achievement and obtain higher marks in the intelligence tests. Results of (Hasanien & Shahidi's Study, 2010), which aimed at recognizing the impact of the integration of vitamin E with vitamin C on learning and memory of white laboratory mice, showed that there is a positive effect upon the integration of vitamins together which would develop the memory work and improving the learning ability. Also, the study of (Harrison, Hosseini, Dawes, Weaver & May, 2009) aimed at recognizing the ability of Vitamin C on preventing the brain oxidation and caused the damage of neurons, by the laboratory experiments on white mice, and resulted in the significant availability of antioxidants with Vitamin C, which contributes in protecting the brain from the oxidation that leads to the damage of cells and occurrence of some diseases such as Alzheimer and others. Likewise, the study of (Veinbergs, Mallory, Sagara & Masliah, 2000) which aimed at recognizing and knowing the impact of Vitamin E and antioxidants on learning and nerves, by the laboratory experiments on white mice, and the results of experiment showed the ability of Vitamin E in preventing nerve damage which causes learning disability for its containment of antioxidants. Similarly, the Study of (Laura, Sydeny, Marcey, Thomas & John, 1996) which aimed at reporting and studying of omega-3 and omega-6 which exists in nut and its relationship with the behavior and learning of children from the age of 6 to 12, revealed that there is a relationship between the variables based on the concentrations of this fatty and amino acids, and proteins, thus whenever the concentration exists in the body in an appropriate ratio, the behavior and learning become more positive, and whenever it decreases, children will suffer from behavioral and learning problems.

Mineral salts are performing important and vital function in the human body, because mineral salts have a significant role in the growth of many kinds of cells in the human body (Alhori, 2012).

However, with regard to learning disabilities and its relationship with nutrition and food ingredients such as sugars, vitamins and minerals, it was summed up by (Binder, 2011) with the non-availability of data or researches at the present time which can support the idea of the occurrence and appearance of learning disabilities in individuals as a result of the deficiency in some of the nutritional elements, and in spite of the shortage in the field of relationship between food, human and learning, and the lack of the required attention in the field of scientific research as indicated by (Rozin, 1998), and the few numbers of researches which didn't exceed 1 % of the total researches in the field of Humanitarian Sciences. However, there are some studies which attempted to link between learning disabilities and nutritional ingredients / components as a study (Wong, Lau, Lim & Fung, 2006) which aimed at surveying the level of Vitamin D in (122) persons from whom they are suffering from learning disabilities; (23) of them were males and (99) were females, who are staying in Hong Kong Hospital and receiving Anticonvulsants Drugs, and comparing them with (37) of the residents in the same hospital and suffering from learning disabilities but don't receive Anticonvulsants Drugs. Study revealed many results such as the existence of vitamin D deficiency in 91.8% of the study sample, and results also showed that vitamin D deficiency

occurred in females more than males, the non-existence of a significant role of age in the occurrence of vitamin D deficiency, and it also revealed a calcium and phosphate deficiency. Further, the study which was done by (Thatcher & Lester, 1985) which aimed at knowing and determining the nutritional and environmental factors and its impact on the brain work of persons who are suffering from learning disabilities by making an analytical study of the different studies which used the laboratory tests and EEG devices. Results of study emphasized the impact / effect of the nutritional components of carbohydrates, vitamins, proteins and also minerals on the brain activity of persons who suffer from learning disabilities. Study introduced many recommendations such as limiting and seizing the nutritional factors which contribute in the cognitive and mental development in the children who are suffering from learning disabilities. In addition to the study which was performed by (Struempler, Larson & Rimland, 1985) which aimed at researching and studying the level of minerals in hair and its relationship with some of the moral and cognitive prompters, in a number of (40) U.S. Navy young recruits who were selected randomly out of (980) recruits, and study revealed that there is a relationship between problems and moral disabilities and also learning disabilities, particularly the reading disabilities, with the non-existence of many minerals such as Zinc, Calcium and Iron in its normal limits / averages whether in an increasing or a decreasing way or appearance in hair. Also, the study of (Marlow, Cossairt, Welch & Errera, 1984) which aimed at studying the level of minerals in hair as a reference and indication of learning disabilities, in a group of (26) persons who suffer from learning disabilities and comparing it with a group of (24) of normal persons, and the results revealed after the analysis of hair specimens of the study sample an increasing in the levels of toxic minerals such as lead, mercury and copper between persons who are suffering from learning disabilities comparing with the group of normal persons. The study which also was done by (Brenner, 1982) which aimed at knowing the level of Vitamin B in a number of (100) children who suffer from a brain disorder and hyper active, and this was performed by a longitudinal study and persistent follow-up, and results of this study showed an existence of Vitamin B deficiency as well as a deficiency in the other nutritional ingredients / components such as minerals and proteins. In the same way, the study implemented by (Mayron, 1978) which aimed at analyzing and investigating many studies in the field of learning disabilities to determine the environmental factors relevant to learning disabilities, and study showed the existence of five environmental factors related to learning disabilities as well as the genetic factors, this elements are showed in anxiety, malnutrition, toxicity, electromagnetic radiations and allergy, and results came ,as per mentioned in the nutrition section, stating that the deficiency in the levels of nutritional ingredients / components such as vitamins, proteins, minerals (e.g. Zinc, Magnesium, Calcium) are between the factors related to cases of learning disabilities.

So, the present study sought to answer many of the questions concerning the biological aspects in people who are suffering from learning disabilities, which represent the problem of study as follows:

Firstly

Are there any statistically significant differences between people with learning disabilities and normal people by secreting thyroid gland hormones?

Secondly

Are there any statistically significant differences between people with learning disabilities and normal people in the levels of mineral salts (e.g. Potassium, Sodium, Calcium, Magnesium)?

Thirdly

Are there any statistically significant differences between people with learning disabilities and normal people in the concentration level of protein?

Importance of Study

The importance of the current study is represented basically in the importance of the right feeding to the individual and the availability of the food ingredients in natural averages in one hand, in another hand, research and provision of information about the organic side and its relation as it is one of the reasons of education hardships through integrity between human theoretical sciences like education, psychology and applied sciences like medicine, pharmacology and nutrition and also the rareness of studies caring for psychological side of food behavior in human in general and in those who have hardships in education in particular.

Goals of the Study

Recognizing differences between those who have hardships in education and their counterparts of ordinary colleagues in the activities of thyroid gland and salts (potassium, sodium, calcium and magnesium) protein concentration average in their bodies and rates of injury among the two groups.

The Study Approach

The current study followed the comparative descriptive approach as it suits the nature and procedures of this study

The Study Sample

The final study sample reaches (46) students, (18) of them with learning hardships and (28) of ordinary students and the smallness of the final study sample refers to the group of hinders which faced the current study represented in financial cost of medical analysis, hardship of transferring lab equipment and medical staff to schools, non-cooperation of some educational institutions, rejection of many of fathers of the checking operation and taking blood samples from their children, it is worth mentioning that those of learning hardships is identified by the public authority of disability affairs in the state of Kuwait according to the Kuwaiti law of disability No.(8) of the year 2010 and presents special education services and the table No 1 shows distribution of the sample individuals.

The Study Tool

The current study used checking sample of students' blood to identify rates of the two hormones of thyroid gland T4, TSH and rate of salts (potassium, sodium, calcium and magnesium) and protein concentration average and comparing them with the result of analysis from the medical lab, the table 2 shows the natural average of these variables.

Results of the First Question

The results of the first question showed when there is disorder in the two hormones of the thyroid gland so K2 was calculated for indication of differences between the injured and the non-injured of the ordinary students and those of learning hardships, and the table 3 shows these results.

The table 3 shows nonexistence of differences of statistical indication between those of learning hardships and ordinary students in the rate of injury of thyroid gland disorders, as the ordinary students are injured with thyroid gland disorders like those students of learning hardships and to understand more about results and research of statistical indications of differences among the two groups, it was dealt with degrees of the two hormones of thyroid gland T4, TSH through using T-test for identifying differences among the two groups and the table 4 shows that.

The table 4 shows that there is no statically indication between students with learning hardships and ordinary students as the average of hormones in ordinary students does not differ from average in students with learning hardships which means that there is no relation or impact between average of injury with disorder in thyroid gland hormones and

learning hardships and this result is not compatible with previous studies results which showed relation between thyroid gland disorders and many of variables with relation with learning hardships like academic achievement ,academic activities and body and behavior properties, as mentioned in literatures of the field of work nature and activity of thyroid gland and properties of those of learning hardships, although this result, we can notice important sides through the two table 4,3 as we find percentages of injury in ordinary people is less than in those of learning hardships, as the percentage of injury in ordinary student reaches (42.8%) while it reaches (55.5%) in those of learning hardships, moreover we notice great spacing between standard deviation values of TSH hormone though the great convergence in arithmetic averages as the standard deviation in ordinary students reaches (1.53) while it reaches (4.13) in those of learning hardships oncoming of the value of arithmetic average and this refers to great amount of dispersion of degrees in those who have learning hardships, consequently, we can say that students with learning hardships is susceptible to injury of thyroid gland disorders more than ordinary students and this is not contrary to current result, however, the result of the answering the first question shows nonexistence of differences of statically indication between ordinary students and those of learning hardships in the average of thyroid gland disorders.

Results of the Second Question

To answer the second question in this study, two procedures was done; the first is checking results of analyzing salts' average in blood in the study sample (46) which resulted in no disorder whether increase or decrease in natural rates of salts in all individuals of study samples, when comparing analysis results of each student in natural rates of salts in body shown in table 2 while the second procedures is represented in dealing with these data statically to search for differences among the two groups by extracting arithmetic average and standard deviation of the two groups, so, using one way anova as a statistical method to reach the results of answering the second question in this question, and table (5) shows the arithmetic averages and standard deviations of salts' rates in the bodies of ordinary students and those of learning hardships.

The table 5 shows great convergence between arithmetic averages and standard deviations of ordinary students and those of learning hardships in the average of salts' concentration in the body, and to understand the results more deeply, the one way anova was used as a statistical method suitable to reach this result, as the four elements; potassium, calcium, and magnesium is integrated and represent the rest of the salts and table 6 show results of this analysis.

It is clear from the results of the anova in Table 7 that there are no statistically significant differences between the average scores of students with learning disabilities and the average scores of normal students, in all averages of the scores of four mineral salts: sodium, potassium, calcium, and magnesium, which indicates that there are no statistically significant differences between students with learning disabilities and normal students in the concentration levels of mineral salts in the body. In the sense that the student with learning disabilities does not differ from the normal student in respect of the rate of mineral concentration in the body, which indicates that there is no role or line between the educational status and the rate of mineral salts concentration in the body.

The results of the second question reveal the absence of any lack or increase in the rates of mineral salts deposition "precipitation"(potassium, sodium, calcium, magnesium) in the body at any member of the study sample with total number of (46) according to the laboratory results of blood samples of these individuals, and thus all individuals of the current study sample, with various educational status, do not suffer from any injury or problem in the rates of mineral salts in their bodies, as the mineral salts in bodies of the current study sample's individuals are able to carry out its important and vital functions in the growth of body cells, maintaining balance, activate its nerves, help the glands to carry

out its vital functions and other functions and benefits. Potassium is capable of carrying out its functions to the fullest and as required such as helping the muscles to contract and relax and to ensure the passage of nerve pulses in the central nervous system. Also Sodium is able to do its role by maintaining the pH, organizing the acid-base balance, and maintaining the water balance inside and outside the cells. As well as the capability of Calcium to carry out its role in building bones, teeth and other functions that are carried out by it. There is no difference for Magnesium which is also capable of carrying out its functions to the fullest through what it offers for the body. As for the results statistically, the study showed that there are no statistically significant difference between the normal students and students with learning difficulties. This indicates that the rate of mineral salts at the students with learning disabilities does not differ statistically from its average at the normal students. It is true that laboratory results proved deposition of mineral salts at the students with learning disabilities at its normal rate.

However, this point did not prevent us from completing the research for more statistical results, but with the presence of these statistical results we can say that the results of the current study confirm that there is no relationship between the individual's learning disabilities and mineral salts (potassium, sodium, calcium, magnesium), as the malfunction and disorder in the central nervous system is the main cause for occurring the learning difficulties cases for students but not resulted from disorders or failure in mineral salts functions in the current study, therefore the developmental learning difficulties resulted from this malfunctions and represented in the failure of cognitive abilities related to perception with its kinds and interest and what is accompanied it with dispersion and weakness in attention and failure in short and long term memorization performance and the reflection of all of these in the manner of academic learning difficulties such as reading or writing learning difficulties or the difficulties of learning mathematics which is unrelated with any kind of disorders of depositing the mineral salts in body at students who suffer from learning difficulties, this assumptions' result is not compatible with the results of previous results about learning difficulties and its relation with nutrition compositions such as mineral salts and others such as Mayron 1978, Thatcher & Lester 1985, Brenner 1982, Marlowe & Cossairt and Wlech & Errera 1984 and other studies related to the nutrition and its relation to the cognitive and behavioral abilities and the ability to learning and intelligence and other variables.

Results of Third Question

The results of third questions through the examining of blood analysis lead to there is no any malfunction from increase of decrease the protein concentration rate to all study sample members at comparing the analysis results for each students with the natural rate of concentrating the protein in the body which indicated in the table No. 2, but for dealing with these data statistically to search for the differences between two groups, it was done through using the T test for indicating to the differences between the arithmetical means as a statistical methods in order to reach to answer for this question and the table No. 7 indicates to results of T-Test to indicate to the differences between normal students and students who have learning difficulties in the concentration rate of protein in the body. It is clear from Table No. 7 that there is no statistically significant differences between students who have learning difficulties and normal students in the concentration rate of protein in the body as the deposit and concentration rate of protein in the body of students who have the learning difficulties was in the normal rate and was not different from the rate of deposit and concentration of protein of normal students, as the protein in the body of the current study sample's students is able to perform the important and vital functions and participation in individual's health and its vitality such as facilitating the digestion process and building the new boney tissues and renew the consumed one and forming enzymes and hormones excreted by Endocrine glands, forming red blood cells to perform the most important functions represented in carrying oxygen to cells and provide the thermal calories required for body, therefore and according to the results of third question, the disorder in functional

performance of central nervous system function which results in learning difficulties with its different developmental sides such as failure in perception, memorization and attention and etc, which leads to academic learning difficulties through which the student faces problem in acquiring the writing and reading skills or to perform the basic arithmetical process and other sides which didn't correlate with the protein rate in the body, however the nutrition importance provided by protein through amino acids for cerebral as effective organ of central nervous system organs and this results is not compatible with the previous studies results related to nutrition and nutrition compositions and its relation to the behavioral and cognitive sides such as Hassanein & Shaidi 2010, Harrison, Hosseini and Dawes, Weaver & May 2009 and it is not compatible with previous studies results which searched in the relation between the learning difficulties and nutrition compositions such as Thatcher & Lester 1985 and Marlowe, Cossairt, Welch & Errera, 1984, although, this assumption's result comes to be compatible with the brief of Bender 2011 about there is no data or research nowadays to support the theory of shortage in some of nutrition factors in individual caused in appearing the learning difficulties in individual.

Recommendation

Upon these results concluded by the current study are summarized in some recommendation which researcher hopes to participate in enriching the field and assisting the specialists, workers and interested person in this field as following:

- Discovering the malfunction and disorder of thyroid since birth participates in its treatment and deals with it without any complications which may lead to disability of developmental retardation cases.
- Earlier Discovery of disorders in nutrition compositions and it didn't deposit in body with its normal rates lead to avoid the problems resulted from misbalance of rates of this nutrition composition.
- Proper nutrition and availability of different nutrition compositions and its existence with required rates in body participate in enhancing the learning process for students, therefore students who have learning difficulties should have the proper and suitable nutrition and the school managements should keen to vary the foods presented for them and it should contain all nutrition compositions.

REFERENCES

1. Alalogi, Sabah Nasser (2008). **Hormones of Endocrine Glands and Reproductive Glands**. Oman: Dar El-Fikr.
2. Alnagi, Ramzi and Alsafdi, Essam (2010). **Physiology**. Oman: Dar Al-Yazori.
3. Abo Zeid, Nadia Abdelmajeed (2008). **Food and Mental Superiority and Everlasting Youth**. Alexandria: Horus International Establishment for Publishing and Distribution.
4. Alhori, Akla (2010) **Directory of Nutrition and Weight and Physical Fitness**. Oman: Dar Alkitab Althaqafi.
5. Alqentar, Fayeze Naif (2005). **Psychology of Nutritional Behavior**. Kuwait: Dar Al-Alam for Publishing and Distribution.
6. Binder, William (2011). **Learning Disabilities** (Translated By: Abdelrahman Sulaiman, Alsayed Altohami, Mahmoud Mohammed Altantawi). Cairo: Alm Alkitab.
7. Sadiq, Mona (2001). **Human Nutrition**. Oman: Dar Almayasara.
8. Brenner, Arnold (1982). The Effects of Megadoses Selected B complex Vitamins on children with Hyperkinesis: Controlled studies with long-term follow-up. **Journal of Learning Disabilities**, 15(5)47-59.

9. Harrison, F.E. Hosseini, A.H. Dawes, S.M. Weaver, S & May, J. M (2009). Ascorbic acid attenuates scopolamine-induced spatial learning deficits in the water maze. **Behavioural Brain Research**, 205, 550-558.
10. Hasanein, P & Shahidi, S (2010). Effects of combined treatment with vitamins C and E passive avoidance learning and memory in diabetic rats. **Neurobiology of Learning and Memory**, 93,472-478.
11. Laura, J, Sydeny, S, Marcey, L, Thomas, K & John, R (1996). Omega-3 fatty acids in boys with behavior. **learning and health problems. Physiology & Behavior**, 59, 4-5.
12. Marlowe, M. cossairt, A. Welch, K & Errera, J (1984).Hair Mineral Content as a Predictor of learning Disabilities. **Journal of Learning Disabilities**, 17(7)418-421.
13. Mayron, L.W (1978). Ecological Factors in Learning Disabilities. **Journal of Learning Disabilities**, 11(8)40-50.
14. Rozin, P (1998). **Towards a Psychology of food choice**. France: monographie chaire danone.
15. Struempler, R. Larson, G & Rimland, B (1985). Hair Mineral Analysis and Disruptive Behavior in Clinically Normal Young Men. **Journal of Learning Disabilities**, 18(10)609-612.
16. Thatcher, R.W & Lester, M.L (1985). Nutrition, Environmental Toxins and computerized EEG: A Mini-Max Approach to learning Disabilities. **Journal of learning Disabilities**, 18(5)287-297.
17. Veinbergs, L. Mallory, M. Sagara, Y. & Masliah, E (2000) Short communication Vitamin E supplementation prevents spatial learning Deficits and dendritic alterations in aged apolipoprotein E-deficient mice. **European Journal of Neuroscience**, 12, 4541-4546.
18. Hinton, Cynthia (2010) .Trends in Incidence Rates of Congenital Hypothyroidism Related to Select Demographic Factors. **Pediatrics**, 125, pp. S37-S47.
19. Kliegman, Robert. Behrman, Richard. Enson, Hal & Stanton, Bonita (2007). **Nelson test book pediatric** .USA: Saunders- an imprint of Elsevier Inc.
20. Lawrence, maill. Mary, Rudolf & Malcolm, levene (2007). **Pediatrics at a glance**. USA: Blackwell publishing ltd.
21. Lissauer, tom & Clayden, graham (2003). **Illustrated textbook of pediatric**. USA: Mosby international limited.
22. Oerbeck, Beate. Kjetil, s. Bengt, f & Sonja, h (2003).Congenital Hypothyroidism: Influence of Disease Severity and L-Thyroxine Treatment on Intellectual, Motor, and School-Associated Outcomes in Young Adults. **Pediatrics**, 112 (4), pp. 923-930.
23. Rovet, Joanne & Robert, Ehrlich (2000) .Psychoeducational Outcome in Children With Early-Treated Congenital Hypothyroidism. **Pediatrics**, 105(3), pp. 515-522.
24. Rovet, Joanne (2005). Children With Congenital Hypothyroidism and Their Siblings: Do They Really Differ?. **Pediatrics**, 115(1), pp. e52-e57 *Wong, s (2004). Children with Congenital Hypothyroidism are at Risk of Adult Obesity due to Early Adiposity Rebound. **Cline Endocrinal**, 61, pp. 4-5.
25. Wong, T. Lau, V. Lim, W & Fung, G (2006).A survey of vitamin D level in people with learning disability in long-stay hospital wards in Hong Kong . **Journal of Intellectual Disabilities**, 10(1)47-59.

APPENDICES

Table 1: Distribution of Sample Individuals

Group	Males	Females	Total
Disabled	7	11	18
Normal	18	10	28
Total	25	21	46

Table 2: Normal Average of the Variables of Study in Human Body

Mineral Salts	Normal Average
T4 Hormone	Pmol/L (13,9-23,2)
TSH Hormone	Uiu/ml (0.28 – 4.20)
Potassium	Mmol / L (3.5 – 5.1)
Sodium	Mmol / L (136 – 155)
Calcium	Mmol / L(2.19 – 2.66)
Magnesium	Umol / L (0.65 – 0.90)
Protein	Measurement Unit (82-63) g/l

Table 3: Chi-Squared Test for the Significance of Differences of the Infection Rate with Thyroid Gland Disorders between Normal Persons and Other Who Have Learning Disabilities

Variables	Number		Chi-Squared	Significance
	Normal	Disabled		
Infected	12	10	0.705	0.547
Non-Infected	16	8		
Total	28	8		

Table 4: T-Test for the Significance of Differences between Normal Persons and Others Who Suffer from Learning Disabilities Regarding the Activity of Thyroid Gland Hormones

Hormone	Normal (N=28)		Disabled (N=18)		T	Significance
	M	O	M	O		
T4	14.98	1.84	14.55	1.40	0.845	0.403
TSH	3.77	1.53	4.93	4.13	-1.356	0.182

Table 5: Means and Standard Deviations of the Level of Mineral Salts in the Bodies of Normal Students and Other Students Who are Suffering from Learning Disabilities

Mineral Salts	Normal (N=28)		Disabled (N=18)	
	M	O	M	O
Potassium	4.30	0.28	4.50	0.39
Sodium	141.07	3.40	141.05	3.47
Calcium	2.41	0.12	2.43	0.10
Magnesium	0.77	0.10	0.77	0.08

Table 6: One Way Anova Analysis between Normal Students and Other Students Who are Suffering from Learning Disabilities as Per Means of the Level of Mineral Salts

Mineral Salts	Variance	Total Sum of Squares	Degrees of Freedom	Mean Squares	(P) Value	Significance
Potassium	Between Groups	0.450	1	0.450	2.807	0.051
	Within Groups	4.856	44	0.110		
Sodium	Between Groups	0.003	1	0.003	0.000	0.988
	Within Groups	518.802	44	11.791		
Calcium	Between Groups	0.004	1	0.004	0.266	0.609
	Within Groups	0.601	44	0.014		
Magnesium	Between Groups	0.000	1	0.000	0.010	0.923
	Within Groups	0.389	44	0.009		

Table 7: T-Test for the Significance of Differences between Normal Persons and Others Who Suffer from Learning Disabilities Regarding Concentration of Protein in the Body

Protein	Normal (N=28)		Disabled (N=18)		(T) Value	Significance
	M	O	M	O		
	73.67	4.53	73.66	4.28	0.009	0.993